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Myofascial release therapy in the treatment of occupational mechanical neck pain: a randomized parallel group study

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Abstract

Objective: As myofascial release therapy is currently under development, the objective of this study was to compare the effectiveness of myofascial release therapy with manual therapy for treating occupational mechanical neck pain

Design: A randomized, single-blind parallel group study was developed. The sample (n = 59) was divided into GI, treated with manual therapy, and GII, treated with myofascial release therapy. Variables studied were intensity of neck pain, cervical disability, quality of life, craniovertebral angle, and ranges of cervical motion.

Results: At five sessions, clinical significance was observed in both groups for all the variables studied, except for flexion in GI. At this time point, an intergroup statistical difference was observed, which showed that GII had better craniovertebral angle (P = 0.014), flexion (P = 0.021), extension (P = 0.003), right side bending (P = 0.001), and right rotation (P = 0.031). A comparative analysis between therapies after intervention showed statistical differences indicating that GII had better craniovertebral angle (P = 0.000), right (P = 0.000) and left (P = 0.009) side bending, right (P = 0.024) and left (P = 0.046) rotations, and quality of life.

Conclusions: The treatment of occupational mechanical neck pain by myofascial release therapy seems to be more effective than manual therapy for correcting the advanced position of the head, recovering range of motion in side bending and rotation, and improving quality of life.

Key words

Neck Pain; Fascia/Pathology; Manual Therapies; Physical Therapy Modalities

Neck pain (NP) is a commonplace musculoskeletal disorder and one of the most common causes of disability and absence from work.[1] It is estimated that 70% of the population will experience NP throughout life and the annual incidence ranges between 15% and 50% of the population.[2,3] NP is more common in women and increases with age, reaching its highest incidence in the sixth decade.[4] Most NP is resolved after 6 wks of treatment, although one third of patients develop chronic symptoms and the relapse rate is approximately 25%.[5]

NP is frequently accompanied by postural disorders, with advanced position of the head being one of the most common.[6,7] This postural disorder has been associated with increased neck, interscapular, and head pain,[8] and some authors suggest an association among the degree of cervical postural alteration, NP, and disability.[9,10] In addition, other authors show an association between cervical postural alterations and restrictions of the active cervical range of motion.[11,12]

In Galicia (Spain), about 40% to 50% of patients with occupational NP affiliated to FREMAP-Mutual Insurance Company for Occupational Accidents and Diseases are treated by its physiotherapy service, and this number of patients comprises about 20% to 25% of their workload.[13] This high rate of cases demonstrates the need to implement more effective treatment techniques for the management of this condition.

A variety of physiotherapy interventions have been used to treat mechanical NP, but few of them have proven effective.[14] It has been suggested that manual therapy (MT) combined with exercise is the most effective physiotherapy intervention in the treatment of NP,[1,15] but a systematic review shows no conclusive results on the effectiveness of this therapy.[16]

In recent years, the interest in the fascial system, understood as a dynamic and continuous structural and functional unification of the body, has increased considerably. Some studies have reported that the fascia, composed of loose areolar fibrous tissue and dense fibrous tissue, forms a three-dimensional network related to all body structures involved in the control and maintenance of an effective posture.[17,18] The number of studies on the clinical effectiveness of MT techniques, such as myofascial release therapy (MRT), has seen a marked increase.

MRT is a relatively new therapy, with increasing acceptance and implementation in the daily clinical work of physiotherapists. However, there is a paucity of studies on biomechanical alterations associated with mechanical NP and its treatment with MRT; consequently, the clinical benefits of MRT remain unclear.[19]

The purpose of this study was to assess the clinical efficacy of MRT in occupational mechanical NP and to determine if MRT has advantages over another MT protocol not including MRT.

Methods

Subjects

Patients from FREMAP participated in the study from January 2010 to December 2010. All patients were informed of the nature and objectives of the study and an informed consent document was signed. The ethics committee of FREMAP approved this research project. This study has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

The inclusion criteria included being between 18 and 65 yrs old, having mechanical NP with or without symptoms that radiated to the head and/or upper limbs,[20] and scoring 10% or higher on the Neck Disability Index or 2 points or more on the Visual Analogue Scale of pain at initial evaluation.[2,21]

Exclusion criteria included NP due to neoplasia, metastasis, severe osteoporosis, infectious or inflammatory processes, fractures, congenital anomalies, herniated disc, whiplash, or cervical stenosis; evidence of cervical spinal cord compromise or radiculopathy; previous neck surgery; NP accompanied by dizziness caused by vertebrobasilar insufficiency or by headaches excluding those of cervical origin; and pregnancy. Patients were also excluded if they had received physiotherapy treatment in the previous 3 mos and had pending legal actions.

A total of 71 patients were asked to participate in the initial screening, but 8 did not meet inclusion criteria, 2 declined to participate in the study for personal reasons, and 2 could not participate for other reasons. A total of 59 patients with NP were randomly distributed into two groups according to two therapeutic intervention programs. Group 1 (n = 29; 18 women/11 men; mean age, 38.24 ± 11.35 yrs) was treated with MT and group 2 (n = 30; 15 women/15 men; mean age, 38.20 ± 10.70 yrs) was treated with MRT. Figure 1 shows the study flow diagram.

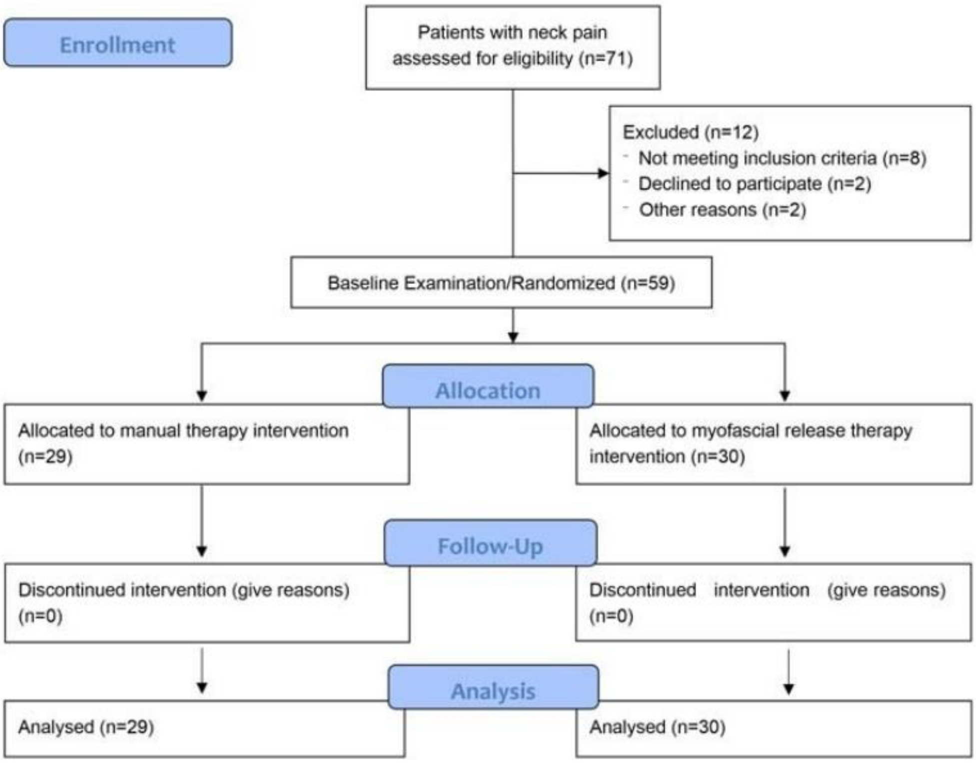

Figure 1. Study flow diagram

Study variables

Sociodemographic data on age, sex, aggravating factors, and duration of symptoms were collected at the initial interview. The assessment was carried out before intervention, after five treatment sessions, and immediately post intervention. The studied variables were 1) NP assessed by the visual analog scale, with a 2-point improvement being considered as clinically significant [2,21]; 2) cervical disability assessed by the Neck Disability Index, with a range of 0 to 50 and total scores expressed as a percentage (internal consistency of alpha: 0.74 to 0.93 and a minimum clinically difference of 5 points)[22,23]; 3) quality of life (QoL) measured by the Short-Form Health Survey 36 (SF-36), which includes eight dimensions: physical function (PF), role physical (RP), bodily pain (BP), general health (GH), mental health (MH), role emotional (RE), social functioning (SF), and vitality (VT), and comprises two global scales: the Physical Component Summary (PCS) and the Mental Component Summary (MCS)[24–26]; 4) active cervical range of motion measured by a goniometer (SP-5060 CROM cervical, Performance Attainment Associates, St Paul, MN)[27]; and 5) the craniovertebral angle, assessed by a universal goniometer manufactured by 3B Scientific Products (Valencia, Spain) that incorporates a bubble level torpedo (Würth SA, Barcelona, Spain).[28]

Intervention protocols

The intervention for both groups consisted of analgesic treatment in accordance with the guidelines of the FREMAP Protocol for the treatment of mechanical NP. The analgesic part of this protocol includes superficial thermotherapy (infrared lamp) and transcutaneous electrical stimulation. In addition, group 1 was treated with MT and group 2 with MRT. There were 10 treatment sessions distributed within four successive weeks, with three sessions being applied the first and third weeks and two sessions being applied the second and fourth weeks.

MT was provided by one physiotherapist, whereas MRT was performed by another physiotherapist, both from FREMAP. The sessions were held for nearly 50 mins, until the completion of the intervention as determined by FREMAP.

Analgesic therapy consisted of the application of superficial thermotherapy by an infrared lamp (Infra 2000, Enraf Nonius) and transcutaneous electrical stimulation (TENSMED 911, Enraf Nonius). The 250-W infrared lamp was focused at a distance of 50 cm on the cervical area for 15 mins. Transcutaneous electrical stimulation application used 80 Hz frequency, 150 µsec pulse duration, with 50 × 50 mm electrodes (Gel-Trode, Enraf Nonius) placed on the painful or metameras areas for 20 mins.

The additional treatments were applied for both groups for 15 mins. MT techniques included 1) anterior-posterior and side-shift of the cervical spine, 2) muscle energy technique involving side bending of cervical spine, 3) neuromuscular technique for restricted C1–C2 rotation, 4) inhibitive occipital distraction, and 5) cervical stretching: postisometric relaxation for the upper trapezius, scalene and sternocleidomastoid muscles.

The MRT included 1) cranial base release, adjusting the relation of the rectus capitis posterior muscles to the dura mater [29]; 2) gross release of the sternocleidomastoid muscle; 3) release of the suprahyoid and infrahyoid muscles; and 4) release of the retrohyoid fascia.

Sample size calculation

Sample size was calculated using the Epidat 3.1 statistical software.[30] For this purpose, a type I error level [alpha] = 0.05, a statistical power of 90%, a minimal clinically significant difference of 2, and a variance of the control group of 4.41 were assumed.[2,31,32] These assumptions implied that each of the study groups should consist of 23 persons. Considering a percentage of losses of 15%, the sample must be composed of at least 54 patients, with 27 patients per group.

Statistical analysis

Data were calculated using SPSS statistical software (SPSS Inc, Chicago, IL) version 18.0. Measures of central tendency and dispersion were used for the quantitative variables, whereas the qualitative variables were measured in frequencies and percentages.

Because of the small sample size, nonparametric tests were used to check the homogeneity of the sociodemographic and clinical characteristics for both groups. For the statistical study of quantitative variables, the Mann-Whitney *U* test for independent samples with 95% confidence interval (95% CI) was used, and for the statistical study of qualitative variables, the *[chi]*^{2} test was used.

For each study group, three measurement time points were used: preintervention, after five treatment sessions, and postintervention. An intention-to-treat analysis was carried out. To assess the effect of each therapy, the Wilcoxon signed-rank test for two related samples was used. To compare the effect of both therapies, the Mann-Whitney test for independent samples was used.

Results

A comparative analysis between the two study groups showed similar baseline clinical and sociodemographic characteristics (Table 1).

TABLE 1. Baseline clinical and sociodemographic characteristics

Parameters	Group 1 (*n* = 29)	Group 2 (*n* = 30)	*P*[a]
Gender	18 women/11 men	15 women/15 men	0.351
Age	38.24 ± 11.35	38.20 ± 10.70	0.927
Pain (0-10)	6.24 ± 1.41	6.60 ± 1.36	0.235
NDI (0-50)	24.46 ± 8.00	22.11 ± 6.91	0.305
PCS (SF-36)	45.21 ± 14.89	43.75 ± 11.46	0.554
MCS (SF-36)	54.05 ± 20.52	52.95 ± 16.18	0.838
C-V angle[b]	43.72 ± 3.16	41.57 ± 4.41	0.076
Flexion[b]	31.79 ± 8.84	30.63 ± 8.80	0.538
Extension[b]	34.55 ± 9.77	37.23 ± 8.05	0.352
R-S bending[b]	31.17 ± 8.86	33.73 ± 7.67	0.267
L-S bending[b]	30.59 ± 7.27	29.53 ± 7.90	0.471
Righ rotation[b]	58.76 ± 14.60	59.63 ± 8.24	0.867
Left rotation[b]	54.52 ± 11.56	53.90 ± 12.55	0.820

Group 1, subjects treated with MT; group 2, subjects treated with MRT. Data are presented as mean ± SD.
[a] No differences were found between groups for any variable ($P > 0.05$).
[b] Values in degrees.
C-V angle indicates craniovertebral angle; L-S bending, left side ben ding; NDI, Neck Disability Index; R-S bending, right side bending.

Pain and Disability

Statistically significant reduction in NP and functional disability (P = 0.000) was observed for both groups at the two assessment times when compared with baseline (Table 2). A comparative analysis of both groups showed that the MRT showed no differences in pain and disability when compared with MT after five treatment sessions and in postintervention assessment.

Quality of life

QoL was assessed only at baseline and at the end of intervention. Group 2 showed a statistically significant increase in PCS scores (*P* = 0.000) and MCS scores (*P* = 0.000), besides the significant increases that were observed in the eight dimensions: PF (P = 0.000), RP (*P* = 0.000), BP (*P* = 0.046), GH (*P* = 0.009), MH (*P* = 0.001), RE (*P* = 0.000), SF (P = 0.001), and VT (*P* = 0.000). For group 1, there were no significant differences in PCS or MCS, although significant increases were observed in PF (*P* = 0.000) and BP (*P* = 0.040) dimensions. There were significant differences between groups for SF dimension (*P* = 0.016) and MCS (*P* = 0.013) (Table 3).

Craniovertebral Angle and Active Cervical Ranges of Motion

After five treatment sessions and in the postintervention assessment, a statistically significant increase in craniovertebral angle and active cervical ranges of motion (flexion, extension, right and left side bending, and right and left rotation, except for flexion after five treatment sessions in group 1) was observed for both groups (Table 2).

Statistically significant differences between groups were observed after five treatment sessions for craniovertebral angle (*P* = 0.014), flexion (*P* = 0.021), extension (*P* = 0.003), right side bending (*P* = 0.001), and right rotation (*P* = 0.031) and in the postintervention assessment for craniovertebral angle (P = 0.000), right (*P* = 0.000) and left (*P* = 0.009) side bending, and right (*P* = 0.024) and left (*P* = 0.046) rotation (Table 2).

TABLE 2. Intragroup and intergroup effects in different variables after five treatment sessions and post intervention

	At Five Treatment Sessions				Post Intervention			
Parameters	Median (IR)	Time Difference[a] (95% CI)	*P*[b]		Median (IR)	Time Difference[a] (95% CI)	*P*[b]	
Pain (0-10)								
G-I	4.00 (2.8)	- 1.50 (4.04-5.44)	0.000[c]	0.354	2.00 (2.00)	- 3.62 (1.80-3.44)	0.000[c]	0.305
G-II	4.00 (3.8)	- 2.22 (3.52-5.07)	0.000[c]		2.00 (1.80)	- 4.37 (1.56-3.03)	0.000[c]	
NDI (0-50)								
G-I	20.00 (9.78)	- 4.65 (16.96-22.66)	0.000[c]	0.091	11.11 (7.39)	- 11.53 (10.05-15.81)	0.000[c]	0.270
G-II	16.00 (12.00)	- 5.95 (13.65-19.02)	0.000[c]		9.00 (7.22)	- 10.86 (8.90-13.75)	0.000[c]	
C-V angle[d]								
G-I	47.00 (3.00)	2.83 (45.59-47.51)	0.000[c]	0.014[e]	49.00 (3.00)	5.00 (47.53-49.92)	0.000[c]	0.000[e]
G-II	48.00 (6.00)	7.52 (47.57-50.57)	0.000[c]		51.00 (5.00)	10.57 (50.86-53.55)	0.000[c]	
Flexion[d]								
G-I	36.00 (11.00)	3.03 (31.68-37.98)	0.050	0.021[e]	40.00 (8.00)	8.14 (37.46-42.41)	0.000[c]	0.110
G-II	40.00 (9.00)	8.76 (36.22-42.06)	0.000[c]		44.00 (5.00)	12.30 (41.66-44.27)	0.000[c]	
Extension[d]								
G-I	41.00 (11.00)	4.24 (36.10-41.49)	0.004[c]	0.003[e]	45.00 (5.00)	7.41 (39.60-44.33)	0.001[c]	0.141
G-II	45.00 (4.00)	5.21 (41.08-44.99)	0.000[c]		45.00 (3.00)	7.30 (43.70-45.95)	0.000[c]	
R-S bending[d]								
G-I	34.00 (9.00)	2.97 (31.41-36.86)	0.018[c]	0.001[e]	38.00 (6.00)	6.24 (35.51-39.32)	0.000[c]	0.000[e]
G-II	41.00 (7.00)	6.10 (37.48-42.10)	0.000[c]		44.00 (3.00)	9.30 (42.20-44.22)	0.000[c]	
L-S bending[d]								
G-I	35.00 (11.00)	4.07 (31.96-37.35)	0.004[c]	0.135	38.00 (7.00)	7.17 (35.60-39.92)	0.000[c]	0.009[e]
G-II	38.00 (11.00)	7.76 (35.00-39.82)	0.000[c]		42.00 (6.00)	12.00 (40.46-43.13)	0.000[c]	
Right rotation[d]								
G-I	63.00 (18.00)	4.14 (58.57-67.22)	0.023[c]	0.031[e]	69.00 (14.00)	9.17 (64.84-71.03)	0.001[c]	0.024[e]
G-II	70.00 (9.00)	8.66 (65.31-71.94)	0.000[c]		72.00 (7.00)	12.53 (70.02-74.60)	0.000[c]	
Left rotation[d]								
G-I	60.00 (15.00)	6.17 (56.13-65.25)	0.005[c]	0.194	68.00 (11.00)	11.48 (62.56-69.44)	0.000c	0.046[e]
G-II	65.00 (16.00)	10.48 (59.83-69.20)	0.000[c]		70.00 (9.00)	17.00 (68.38-73.75)	0.000[c]	

G-I, subjects treated with MT. G-II, subjects treated with MRT.
[a]Calculated with respect to baseline values.
[b]The left and right columns present intragroup and intergroup change *P* values, respectively.
[c]Significant differences in intragroup change values ($P < 0.05$).
[d]Values in degrees.
[e]Significant differences in intergroup change values ($P < 0.05$).
C-V angle indicates craniovertebral angle; IR, interquartile range; L-S bending, left side bending; NDI, Neck Disability Index; R-S bending, right side bending.

TABLE 3. Intragroup and intergroup postintervention effects of therapies in QoL (SF-36)

SF-36 Dimensions and Component Summaries	Postintervention			
	Median (IR)	Time Difference [a] (95% CI)	P^b	
PF				
G-I	80.00 (22.50)	13.62 (66.29-81.99)	0.000[c]	0.517
G-II	77.50 (20.00)	10.33 (70.10-84.57)	0.000[c]	
RP				
G-I	37.50 (21.88)	0.86 (32.39-46.49)	0.599	0.070
G-II	43.75 (12.50)	17.50 (40.06-48.27)	0.000[c]	
BP				
G-I	15.00 (0.00)	-9.28 (13.01-20.85)	0.040[c]	0.981
G-II	15.00 (12.88)	-6.20 (13.82-23.11)	0.046[c]	
GH				
G-I	50.00 (30.00)	2.76 (51.98-64.57)	0.126	0.532
G-II	60.00 (36.25)	4.00 (53.19-68.15)	0.009[c]	
PCS				
G-I	48.75 (12.03)	1.99 (42.74-51.66)	0.187	0.275
G-II	50.03 (11.55)	6.41 (46.17-54.16)	0.000[c]	
MH				
G-I	60.00 (20.00)	4.83 (53.83-67.21)	0.075	0.179
G-II	62.50 (30.00)	8.33 (61.33-74.33)	0.001[c]	
RE				
G-I	75.00 (50.00)	0.29 (48.88-70.09)	0.689	0.146
G-II	75.00 (33.33)	18.61 (61.72-77.17)	0.000[c]	
SF				
G-I	62.50 (25.00)	1.72 (48.14-63.93)	0.559	0.016d
G-II	68.75 (37.50)	10.41 (62.47-76.70)	0.001[c]	
VT				
G-I	43.75 (12.50)	-1.08 (40.04-51.77)	0.916	0.076
G-II	50.00 (25.00)	8.75 (45.66-56.42)	0.000[c]	
MCS				
G-I	54.58 (19.64)	1.43 (49.17-61.80)	0.218	0.013[d]
G-II	65.05 (22.30)	11.52 (59.87-69.08)	0.000[c]	

G-I, subjects treated with MT; G-II, subjects treated with MRT.
[a] Calculated with respect to baseline values.
[b] The left and right columns present intragroup and intergroup change *P* values, respectively.
[c] Significant differences in intragroup change values ($P < 0.05$).
[d] Significant differences in intergroup change values ($P < 0.05$).
IR indicates interquartile range

Discussion

In recent years, the growing interest in the myofascial system has generated an increase in studies on the effectiveness of MRT for reducing pain and correcting posture.[33–35] However, a literature review shows a paucity of randomized controlled trials on the effectiveness of MRT, especially in cervical biomechanical alterations associated with mechanical NP, to ensure reliability of the clinical outcomes.[19]

The results of the current study show that physiotherapy intervention programs, MRT and MT, are effective and clinically relevant for reducing pain and disability and improving QoL, craniovertebral angle, and active cervical mobility range in patients with occupational mechanical NP. In addition, no adverse effects have been reported by the participants in either group during the intervention.

In this study, both therapeutic interventions provided pain reduction, consistent with other studies showing that MT techniques reduce pain in patients with mechanical NP,[32,36,37] but no statistically differences between both interventions in reducing pain were noted. Although the authors have not found any studies on the effectiveness of MRT in occupational mechanical NP, a study on the effectiveness of this technique in nonspecific cervical pain showed a significant reduction in pain,[38] something observed also in this study. It is important to note that the mentioned study [38] coincides with this study and other studies [39,40] regarding the duration of each myofascial release technique used, 2 to 3 mins.

It was observed that both therapeutic procedures improve the QoL of patients with occupational mechanical NP. Group 1 showed significant changes only in the dimensions of PF and BP, whereas group

2 achieved significant improvements in both PCS and MCS, in addition to improvements in the eight dimensions of the questionnaire. This study's results seem to be in agreement with other studies showing that MRT is more effective than other treatments, including MT, at improving the QoL.[41,42] In patients with fibromyalgia, the comparative analysis between MRT and placebo treatments showed that MRT improved scores in PCS dimensions of the SF-36, including PF, RP, and BP, as well as obtaining higher scores in the dimension of social function included in MCS of the SF-36,[41] which is in accordance with the results of this study, where improvements in PCS and MCS were observed for the MRT group.

Several studies have reported that the degree of cervical postural change is directly related to the severity of the NP [7,9,10] and movement restrictions of the cervical spine.[11,43,44] No studies were found on the effect of MRT in the craniovertebral angle or the forward position of the head in any neck dysfunction. In this study, both therapies seemed to be effective for correcting the forward position of the head (for increasing the craniovertebral angle) in occupational mechanical NP (P = 0.000). Results obtained with MT (5.00 degrees; 95% CI, 3.63–6.38) were similar to results obtained by Lau et al.[45] with a combined treatment of MT and general physiotherapy in patients with chronic NP. In this study, the analysis comparing both procedures showed higher effectiveness of MRT for correcting the forward position of the head, and the difference was significant at five sessions of treatment (P = 0.014) and even higher in the postintervention assessment (P = 0.000).

According to Lau et al.,[10] a variation higher than 3.61 degrees in craniovertebral angle could be considered significant in diagnosing clinical alterations in this area, whereas other authors [9] consider a value higher than 5 degrees significant in predicting clinical alterations. Both of the therapeutic interventions in this study were in agreement with this and showed a positive response at the posttreatment evaluation in correcting the advanced position of the head. However, only MRT was clinically relevant after five treatment sessions (7.52 degrees; 95% CI, 6.21–8.83) when compared with MT (2.83 degrees; 95% CI, 1.80–3.86). At posttreatment, there was a clinically relevant difference between MRT improvement (10.57 degrees; 95% CI, 8.98–12.15) and MT improvement (5.00 degrees; 95% CI, 3.63–6.38).

No studies could be found on the effect of MRT on cervical active mobility in occupational mechanical NP. In this study, a significant increase in cervical active mobility at posttreatment assessment was observed in group 1 (MT) and group 2 (MRT), whereas significant intergroup changes were not observed for flexion and extension. Other studies including manual techniques also observed improvement in cervical mobility [36,46] for patients with NP. However, in the study by Bronfort et al.,[36] the intervention was based on spinal manipulation and rehabilitative neck exercises and the total intervention included 20 sessions in 11 wks. On the other hand, in the study by Hoving et al.,[46] the MT intervention consisted of muscular, specific articular mobilization and coordination or stabilization techniques to treat segmental movement dysfunction and the total intervention included 12 sessions (two per week) in 6 wks.

Regarding the cervical active mobility ranges, an angular variation between 5 and 10 degrees is needed to determine a real change in spine mobility when AROM measurements are done using cervical range of motion.[47] In this study, the mean significant improvement after the intervention with MRT was 12.30 degrees for flexion, 7.30 degrees for extension, 9.30 degrees for right side bending, 12.00 degrees for left side bending, 12.53 degrees for right rotation, and 17.00 degrees for left rotation and was higher than those observed in different studies on MT.[46,48,49] The results of this study indicate that MRT could contribute to correct cervicodorsal biomechanics, improving cervical active mobility ranges.

Study Limitations

This study has limitations that influence the analysis of the results. The focus on the working population complicates the comparability of this study's results with different populations with mechanical NP and suggests caution in interpretation of the results. Further studies with larger samples and follow-up periods are necessary to determine the long-term clinical benefits of MRT.

Conclusions

This study suggests that, in patients with occupational mechanical NP, both MRT and MT could result effective in reducing pain and disability in those patients, although only MRT showed significant improvements after five treatment sessions. In addition, MRT with respect to MT showed better results regarding QoL, cervical range of motion, and the forward position of the head.

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